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REMARKS

This is a full and timely response to the final Official Action mailed February 9, 2007 (the "Office Action" or the "final Office Action"). Reconsideration of the application in light of the following remarks is respectfully requested.

Request for Continued Examination:

Applicant hereby requests Continued Examination for this application and entry and consideration of this amendment consequent thereto.

Claim Status:

Claims 29-46 were withdrawn from consideration under a previous Restriction Requirement and cancelled without prejudice or disclaimer. By the present paper, various claims are amended. Additionally, claim 27 has been cancelled without prejudice or disclaimer and new claims 50 to 60 have been added. Thus, claims 1-26, 28 and 47-60 are pending for further action.

Prior Art:

Claims 15-20, 48 and 49 were rejected as anticipated under 35 U.S.C. § 102(e) by U.S. Patent App. Pub. No. 2004/0258729 to Czernuszka et al. ("Czernuszka"). For at least the following reasons, this rejection is respectfully traversed.

Claim 15 recites:

> A method for producing porous structures in a three-dimensional object with solid freeform fabrication comprising:
> selectively depositing a rapidly solidifying build material in a porous configuration; and

> coupling said deposits of rapidly solidifying build material to form said three-dimensional object.

In this regard, the Office Action clearly misunderstands the teachings of Czernuszka. Czernuszka teaches fabricating a *mold* using solid freeform fabrication (SFF). (Czernuszka, paragraph 0009). Then, Czernuszka teaches "placing a composition comprising [a] polymer in [the] mould possessing one or more voids therein, said mould being a negative of the desired shape of the scaffold [i.e., the object being formed], causing the polymer to acquire the shape of the mould." (Czernuszka, paragraph 0007). According to Czernuszka, the mould is then removed, e.g., dissolved. (*Id.*).

Apparently, the Office Action considers the method of forming the mould taught by Czernuszka as being read on by the method recited claim 15. This is clearly incorrect. According to the Office Action, "the 'mold' of Czernuszka is a structure made by SFF with ink-jet print heads (selective depositing). The structure becomes porous after removal of support material." (Action of 2/9/07, p. 10). What the Office Action misses is that the "selectively deposited" mold *is* also the support material that is removed. Czernuszka's method concludes with "removing the mould and causing pores to be formed in the polymer." (Czernuszka, paragraph 0007). Thus, the temporary mold taught by Czernuszka cannot be the object formed by the method recited in claim 15.

In short, Czernuszka teaches selectively depositing a "sacrificial material" to form a mould. (Czernuszka, paragraph 00098). Czernuszka does not teach or suggest the claimed selectively depositing a rapidly solidifying *build material* in a porous configuration. (*See* Applicant's specification, paragraph 0019). Czernuszka further does not teach or suggest "coupling said deposits of rapidly solidifying build material to form said three-dimensional object."

"A claim is anticipated [under 35 U.S.C. § 102] only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) (emphasis added). See M.P.E.P. § 2131. For at least this reason, the rejection of claims 15-20 should be reconsidered and withdrawn.

The various dependent claims recite subject matter that is also clearly patentable over Czernuszka. Specific, non-exclusive examples follow.

Claim 16 recites "further comprising disposing a property enhancing material in said porous configuration." In this regard the Office Action cites to paragraph 0018 of Czernuszka. (Action of 2/9/07, p. 3). However, this portion of Czernuszka teaches putting a material into a mold to form a porous tissue scaffold. It does not teach or suggest the claimed method including disposing a property enhancing material into the pores or porous configuration of an object formed by "selectively depositing a rapidly solidifying build material in a porous configuration." As noted above, the Office Action fails to appropriately distinguish between the sacrificial mold formed by Czernuszka and the scaffold then formed in the mold. For at least this additional reason, the rejection of claim 16 should be reconsidered and withdrawn.

Claim 18 recites "wherein said coupling said deposits of rapidly solidifying build material comprises depositing coupling material on said deposits of rapidly solidifying build material such that said coupling material overhangs said porous configuration." In this regard, the Office Action cites to a portion of Czernuszka that again refers to the fabrication of a mold from "sacifical material" (Action of 2/9/07, p. 3) and that has nothing do with a coupling material for deposits of *build* material. Czernuszka clearly does not teach or suggest "depositing coupling material on said deposits of rapidly solidifying build material such that said coupling material overhangs said porous configuration." Czernuszka does not even appear to mention a coupling material within the meaning of Applicant's claims. For at least this additional reason, the rejection of claim 18 should be reconsidered and withdrawn.

Claim 19 recites "wherein said selectively depositing a rapidly solidifying build material in a porous configuration comprises vertically stacking voxels of said rapidly solidifying build material with a high precision material dispenser." As demonstrated above, Czernuszka teaches the use of a mold to form a tissue scaffold. Czernuszka does not teach or suggest "stacking voxels of said rapidly solidifying *build* material with a high precision material dispenser." (Emphasis added). For at least this additional reason, the rejection of claim 19 should be reconsidered and withdrawn.

Claims 21-26 were rejected as anticipated under 35 U.S.C. § 102(e) by U.S. Patent App. Pub. No. 2003/0006534 to Taboas et al. ("Taboas"). By the present amendment, claim 27 has been cancelled and the recitations thereof add to claim 21. Consequently, this rejection based on Taboas of claim 21 and its dependent claims is moot, and the rejection formerly made against claim 27 will be considered below with respect to amended claim 21.

Claims 1-6, 9-11 and 13-14 were rejected as unpatentable under 35 U.S.C. § 103(a) in view of WO Pub. 00/29202 to Monkhouse et al. ("Monkhouse"). For at least the following reasons, this rejection is respectfully traversed.

Claim 1 recites:

> A method for producing porous structures in a three-dimensional object with solid freeform fabrication comprising:
>
> in a solid freeform fabrication device having a fabrication bin, selectively depositing a removable support material at selected locations within said fabrication bin in a pattern corresponding to pores desired in a layer of said porous structure of said object;
>
> in said fabrication bin, depositing a liquid, curable build material around said removable support material, said support material defining a shape of at least a layer of said three-dimensional object formed with said build material; and
>
> removing said selectively deposited removable support material to form said pores within said three-dimensional object.

Support for the amendments of claim 1 can be found in Applicant's originally filed specification at, for example, Fig. 2 and paragraph 0053.

In contrast Monkhouse does not teach or suggest "selectively depositing a removable support material at selected locations within said fabrication bin in a pattern corresponding to pores desired in a layer of said porous structure of said object." In this regard, the Office Action, without explanation, cites to two totally different embodiments taught by Monkhouse, a drug delivery device on p. 14 and a tissue regeneration device on p. 15. (Action of 2/9/07, p. 5).

In the drug delivery context, Monkhouse teaches a binder which is selectively injected into a powdered or particulate polymer material (Monkhouse, p. 14, lines 7-9). No "support material" is selectively deposited in this embodiment. In the tissue regeneration device, Monkhouse teaches depositing a "soluble phase" and then "[l]oose powder can be spread after completion of the patterning [with soluble material]. The external or insoluble features of the specimen can then be built by printing with binder solution." (Monkhouse, p. 15, lines 23-29). Again, no "support material" is deposited. Thus, Monkhouse fails to teach or suggest the claimed "selectively depositing a removable support material at selected locations within said fabrication bin in a pattern corresponding to pores desired in a layer of said porous structure of said object."

Monkhouse further fails to teach or suggest "in said fabrication bin, depositing a *liquid*, curable build material around said removable support material, said support material defining a shape of at least a layer of said three-dimensional object formed with said build material." (Emphasis added). In both disparate embodiments cited in the Office Action, Monkhouse teaches a *powdered* build material, as demonstrated above. Consequently, Monkhouse fails to teach or suggest "depositing a ***liquid***, curable build material around said removable support material." (Emphasis added).

"To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974)." M.P.E.P. § 2143.03. Accord. M.P.E.P. § 706.02(j). For at least these reasons, the rejection of claim 1 and its dependent claims based on Monkhouse should be reconsidered and withdrawn.

The various dependent claims recite subject matter that is also clearly patentable over Monkhouse. Specific, non-exclusive examples follow.

Claim 2 recites: "further comprising selectively depositing a non-removable support material." In this regard, the Office Action cites a new portion of Monkhouse entitled "Incorporation of Inactives." This portion of Monkhouse deals with drug delivery in which different regions of a powdered material are bound with an "active (e.g., a drug)" (Monkhouse, p. 12, line 21) and other portions are bound with a placebo binder (Monkhouse,

p. 13, line 2). The Office Action attempts to refer to the placebo binder as the non-removable support material. (Action of 2/9/07, p, 5). This is utterly unreasonable.

The placebo binder is not a support material, but is a binder injected into a powdered material layer. As defined in Applicant's specification, and as clearly understood in the art, a support material is defined as a "material configured to receive and support the above-mentioned build material." (Applicant's specification, paragraph 0019). Accordingly, it is completely unreasonable to suggest that the placebo binder taught by Monkhouse is somehow the claimed non-removable support material. Consequently, Monkhouse clearly does not teach or suggest the subject matter of claim 2. For at least this additional reason, the rejection of claim 2 should be reconsidered and withdrawn.

Claims 9 and 12 were rejected as unpatentable under 35U.S.C. § 103(a) over the combined teachings of Monkhouse and Taboas. This rejection is respectfully traversed for at least the same reasons give above with respect to claim 1.

Additionally, claim 9 recites "wherein said selectively depositing a removable support material comprises depositing said removable support material with a high-precision dispenser and wherein said depositing a build material comprises depositing said build material with a low-precision dispenser." As demonstrated above, the Office Action is mistaken in thinking that Monkhouse teaches or suggests a high-precision dispenser depositing a removable support material. Moreover, the Office Action concedes that Monkhouse does not teach the claimed low-precision dispenser depositing a build material. (Action of 2/9/07, p. 7).

Consequently, the Action cites to Taboas. However, regardless of whether Monkhouse and Taboas may be so combined or teach the subject matter alleged by the Office

Action, claim 9 depends from claim 1 which states that the removable support material and the build material are *both* dispensed, with high and low precision dispensers respectively, into a common fabrication bin. In contrast, neither Monkhouse nor Taboas, nor the combination thereof, teaches or suggests this subject matter. For at least these additional reasons, the rejection of claim 9 should be reconsidered and withdrawn.

Claims 7 and 8 were rejected as being unpatentable under 35U.S.C. § 103(a) over the combined teachings of Monkhouse and U.S. Patent No. 6,228,437 to Schmidt ("Schmidt"). Additionally, claims 27 and 28 were rejected over the combined teachings of Taboas and Schmidt. As noted above, independent claim 21 is amended herein to include the recitations of claim 27. Therefore, it is presumed that this rejection of claim 27 might be applied to claim 21, as amended. For at least the following reasons, the rejection of claims 7 and 8, and any similar rejection that might be applied to claim 21, is respectfully traversed.

Claim 7 recites:

> A method for producing porous structures in a three-dimensional object with solid freeform fabrication comprising:
> selectively depositing a removable support material;
> depositing a build material defining said three-dimensional object; and
> removing said selectively deposited removable support material to form a number of pores within said three-dimensional object; and
> infiltrating said pores with a property enhancing material.

Claim 21 recites:

> A method for producing porous structures in a three-dimensional object with solid freeform fabrication comprising:
> forming a plurality of containment structures by selective depositing of a support material with a material dispenser;
> dispensing bulk build material into said containment structures; and
> removing said containment structures to form pores in said build material; and
> infiltrating said pores with a property enhancing material.

The recent Office Action concedes that neither Monkhouse nor Taboas teach or suggest "infiltrating said pores with a property enhancing material." (Action of 2/9/07, pp. 7 and 8). Consequently, in both cases, the Office Action cites the teachings of Schmidt with the following rationale: "Schmidt teaches infiltrating an SFF porous structure with a pre-ceramic polymer thereby enhancing the mechanical strength (toughness) of the structure. ... One of ordinary skill in the art at the time of the invention would have found it obvious to include in the method of Monkhouse [or Taboas] the property enhancing technique of Schmidt." (*Id.* at pp. 7-9). Applicant vehemently disagrees.

As cited by the Office Action, Monkhouse teaches a tissue scaffolding that is implanted so that tissue can be grown in and around the scaffolding in a desired manner. The pores or "channels" taught by Monkhouse are used as vessels for tissue growth. "The width of the channels can range from about 150 to 500 microns, with 200 microns preferred to maximize the surface area available for cell seeding without compromising structural integrity or homogeneity of tissue formation." (Monkhouse, p. 16, lines 10-12).
Taboas likewise teaches a similar tissue regeneration scaffold. (Taboas, paragraph 0003).

Schmidt, however, teaches "*packing* the pores in a freeform part with an infiltrant, such as a preceramic polymer ... thereby increasing the density of the freeform part." (Schmidt, abstract) (emphasis added). Schmidt also describes the *packing* of the pores with the infiltrant as "reducing" the porosity of the fabricated part. (*Id.*).

Consequently, one of skill in the art would *not* have found it obvious to pack or plug the channels or pores taught by Monkhouse or Taboas with a preceramic material as taught by Schmidt. As explained above, those pores are opened and formed expressly to provide a space in which tissue is supposed to grow. Packing the pores, as suggested by Schmidt would, therefore, have utterly destroyed the purpose of the Monkhouse or Taboas structure as a tissue scaffold.

"If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)." M.P.E.P. § 2143.01. For at least these reasons, the rejection of claims 7, 8, 27 and 28 should be reconsidered and withdrawn.

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Conclusion:

The newly added claims are thought to be patentable over the prior art of record for at least the same reasons given above with respect to the original independent claims. Therefore, examination and allowance of the newly added claims is respectfully requested.

For the foregoing reasons, the present application is thought to be clearly in condition for allowance. Accordingly, favorable reconsideration of the application in light of these remarks is courteously solicited. If the Examiner has any comments or suggestions which could place this application in even better form, the Examiner is requested to telephone the undersigned attorney at the number listed below.

Respectfully submitted,

DATE: April 9, 2007

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